High Speed Rail and the tourism market: Evidence from the Madrid case study

Francesca Pagliara , Andrea La Pietra , Juan Gomez , José Manuel Vassallo

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A B S T R A C T

Marketing decisions and strategic planning of tourism provisions require improving the knowledge of factors affecting tourism demand, as well as making better forecasts of tourism flows in the short and long-term. In this respect, approaching how holidaymakers select their holiday destinations and investigating which factors determine their choices emerge as a key challenge. The aim of this paper is to analyze the role of High Speed Rail systems on destination choice, specifically on urban tourism destinations. To that end, a quantitative analysis is carried out through logistic regression models aimed at analyzing how different explanatory variables affect tourists' choice of a destination. A Revealed Preference survey was conducted in June 2013 in Madrid, where tourists were interviewed close to the most attractive tourist sites. Preliminary results show that the Spanish High Speed Rail system seems to have a significant effect on the tourists' choice to visit other cities close to Madrid, but the choice of Madrid as a tourist destination is not influenced by the presence of High Speed Rail. Indeed other factors play a significant role.

1. Introduced

Tourism competitiveness is an important economic indicator since it strengthens two-way trade and promotes export income. According to the World Economic Forum (2013), Switzerland, Germany and Austria lead the world in terms of travel and tourism competitiveness, with Spain, the United Kingdom, the United States, France, Canada, Sweden and Singapore completing the top 10.

As pointed out by Della Corte et al. (2010), tourist destinations are a complex integrated product, defined by the "six As": *Access,* representing the accessibility to a location; *Attractions,* which are the local attractive factors; *Accommodation,* referring to hotel structures; *Amenities*, representing tourist services; *Assemblage*, indicating the activity of tour operators; and *Ancillary services,* that are represented by agencies, offering services like tours and local institutes and supporting organizations.

In this paper we study the influence that a specific type of *Access,* the one provided by High Speed Rail (HSR), has to boost tourism. We make the hypothesis that HSR can have an impact on tourists' choice of the place where to spend their holidays. This hypothesis is based on the fact that HSR has distinctive advantages compared to other transportation modes in terms of travel time, comfort, safety and reliability.

Determining the impact of infrastructure on tourism is crucial for governments intending to promote this service. The coordination among the different stakeholders is crucial for making a certain destination competitive compared to others. For this reason, infrastructure has to be coordinated with other aspects such as destination promotion, image, coordination of local stakeholders and marketing on local tourism and community.

On the other hand, getting to know the needs of tourist is becoming increasingly complex since they have more information, more needs and they are more focused on the quality–price relationship. Moreover information technologies are shaking up the decision making processes because they have opened the access to more demand targets and have allowed new forms of web-specialized organizations, like internet providers, which have become market leaders. In addition, globalization is another important feature, making competition higher since each single firm has to compete with many others at international level.

There exists a significant literature investigating the determinants of tourism flows. Travel prices, exchange rates and tourism infrastructure are among the most prominent determinants in the existing empirical literature. A number of authors have cited the infrastructure base of a country as a potential determinant of the attractiveness of a tourism destination. Infrastructure represents an integral part of the tourism package; for example, "*road*

infrastructure enhances accessibility of tourists to different parts of the destination country while sound airport infrastructure ensures that tourists experience a comfortable transition from the plane into the borders of the destination country and vice versa" (Seetanah et al., 2011). Kaul (1985) also recognizes the importance transport as an essential component of successful tourism development in that it induces the creation of new attractions and the growth of existing ones.

The objective of this paper is to get to know the influence of HSR services on the choice of a tourist destination, as well as on the probability to visit other cities for the case of Madrid (Spain). To that end, we developed a Revealed Preference survey to identify the factors influencing the probability of revisiting a tourist destination, as well as the impact of HSR services on this choice.

The paper is organized as follows. Following this introduction, in Section 2 we report an overview of previous contributions on the link between transport–HSR in particular– and the tourism market. In Section 3 we explain the specific situation of HSR and tourism for the case study of Spain. Section 4 defines the methodology and describes the survey conducted to obtain the dataset for the case study of Madrid. In Section 5 we describe the results. In Section 6 we conclude and outline future research topics.

2. Transport and tourism: an overview

The relationship between tourism and transport has been widely addressed in the literature, specifically in the last decade. Some authors (Seetanah and Khadaroo, 2009; Khadaroo and Seetanah, 2008) have pointed out the contribution of transport infrastructure to the attractiveness of tourism destinations. Additional aspects such as environmental impacts of tourism transport (Peeters et al., 2007) or potential benefits of integrating transport and tourism policies (Scuttari et al., 2013) have also been discussed. In particular, it is commonly mentioned that tourism and air transport are intricately linked (Bieger and Wittmer, 2006), so a large literature concerning this topic has been developed. Dobruszkes and Mondou (2013) and Warnock-Smith and Morrell (2008) analyzed to what extent the liberalization of the airline market has led to significant changes in both air services and tourism growth. Rey et al. (2011) and Davison and Ryley (2010) estimated the impact of low-cost airlines activity on tourism, as well as price sensitivity to flying by population segment. Other studies have focused on issues such as airlines corporate strategies (O'Connell and Warnock-Smith, 2012) and carbon pricing on aviation (Duval, 2013).

The relationship between road transport and tourism has received little attention. The existing literature (Aguilo et al., 2012; Martin-Cejas and Sanchez, 2010) is mainly focused on evaluating road transport usage in tourist islands and determining tourism-associated externalities. Furthermore, Jou et al. (2012) examined the behavior of tourists following the opening of a new freeway. Other authors have addressed some aspects regarding tourism and urban public transport, such as the design of tourism bus networks (Lumsdom, 2006), key factors for successful tourism public transport provision (Gronau and Kagermeier, 2007) and the effect of tourism demand on public transport services (Albalate and Bel, 2010).

Finally, there is still limited research concerning rail transport and tourism demand. A transport innovation such as a HSR service modifies the link between tourists and accessibility (Masson and Petiot, 2009; Delaplace, 2012) because a decrease of traveling time can be analyzed as a decrease of distance. As travel time is one of the items of total costs assumed by tourists, HSR can therefore decrease generalized transport costs. Consequently, HSR can affect the utility of tourists and the competition between destinations (Masson and Petiot, 2009), since the market area can be enlarged. As pointed out by Wang et al. (2012), some cities can be reinforced by a new HSR line while others could be disadvantaged. For the case of China, Chen and Haynes (2012) concluded that those provinces served by HSR services "*are likely to have approximate 20% additional numbers of foreign arrivals and 25% greater tourism revenues than provinces without such systems*". According to these authors, HSR will have an effect on strengthening competitiveness in tourism.

Based on a literature review and on interviews, Bazin et al. (2011) developed a qualitative analysis to assess the impact of HSR on urban and business tourism on French cities close to Paris. They showed that this kind of tourism may be fostered by HSR for at least three reasons. First, urban tourism is generally short-stay tourism (around two or three days), especially during weekends. Consequently, using HSR avoids the fatigue of driving, congestion and parking difficulties. Second, in some countries and during certain times of the year, especially with some promotional offers, it can be cheaper than road trips when travelling alone or in couple. Third, HSR can be more comfortable and even save time when compared to air transportation, particularly when the rail station is located in the center of the city.

There are also several contributions in the literature concerning the competition of HSR systems with other transport modes, such as car (Cascetta et al., 2011) and air transportation (Pagliara et al., 2012), this one specifically for the Madrid–Barcelona corridor.

Another interesting aspect for tourism is to study tourists' intention to revisit a specific destination. In this respect, we can hypothesize that the increase of accessibility achieved by HSR can foster the tourists´ intention to revisit a city. Very limited contributions are present in the literature concerning this point. The paper by Seddighi and Theocharous (2002), which analyzes the probability of revisiting Cyprus in terms of socio-demographic and destination characteristics, can be considered one of the most important papers in this field. They developed a micro-econometric approach based on observations of holidaymakers. This approach allows the examination of the characteristics influencing individual travel behavior, and provides a conceptual framework to understand the nature, form and character of the holiday decision-making processes of individuals. Furthermore, the research conducted by Barros and Assaf (2012) analyzed the different covariates of revisiting Lisbon by using a mixed logit model and a mixed logit with bounded parameters model. They concluded that the probability of revisiting Lisbon "*increases significantly with accommodation range, events, food quality, expected weather, beach, overall quality, nightlife, reputation, and safety*". The authors also showed that the overall quality and reputation variables, which are not statistically significant in the logit model, become statistically significant in the mixed logit model. Finally, Delaplace et al. (2014) investigated the factors influencing destination choice for tourism purposes and the role of HSR systems in affecting this choice to revisit Rome and Paris.

3. The tourism market and the High Speed Rail system in Spain

This section presents the main aspects concerning the relationship between HSR and tourism for the case study of Spain. It is divided into two subsections. In the first one the specific features of the tourism market in Spain described, while in the second subsection the development and characteristics of HSR transport in this country are reported.

3.1. The tourism market in Spain

Tourism is deemed to be the most important economic sector in Spain, both in turnover and in number of workers (Rodríguez, 2010). According to the OECD (2012), it accounts for almost 10% of GDP and 11% of employment in the country, far above average values in OECD nations (4.2% and 5.4%, respectively). Despite reductions undergone in the last few years, tourism continues to be one of the mainstays of the Spanish economy and an outstanding driver of social development. It is also a key sector to offset the current account trade deficit of the country. In this respect, the positive balance of tourism and travel (+31.6 billion euro in 2012) in the Balance of Payments (BOP) covered 123% of Spain´s trade deficit (Ministerio de Industria, Energía y Turismo, 2013), far better results than those achieved in previous years. Beyond its relative importance as an economic sector, tourism has a significant multiplying effect on society and territories, as well as strong implications on other strategic sectors in the country such as construction, environment, health, etc.

With a total of 57.7 million visitors in 2012 (Instituto de Estudios Turísticos, IET, 2013), Spain ranks fourth in the world by number of arrivals after France, United States and China. In the last decade (2002–2012), entries in the country have increased by 14.7%. With regard to international tourism receipts, Spain is the second largest earner worldwide and the first in Europe, with a total of US$ 59.9 billion in 2011 (UNWTO, 2012). Since 2004, tourism expenditure has risen by 20.2%, with an average annual growth of 2.4%.

The type of tourism offered in Spain is mainly the so-called*sun and beach* tourism. For this reason, tourism is characterized by a strong seasonal component, as most of the demand concentrates between the months of July and September. Although different indicators show that Spain´s level of competitiveness is dropping in certain factors (Rodríguez, 2010), the country has a large base of customers with a high level of satisfaction in their visit, repeatedly choosing this destination for their travel or holidays. According to data from the Instituto de Estudios Turísticos, IET (2013), the tourism market in Spain is characterized by a high presence of Britons (23.7%), followed by Germans (16.2%) and French population (15.5%). Noticeable increases have been observed in the arrival of people from Scandinavia and Russia in the last few years. Regarding regional destinations within Spain, Catalonia (25.0%) comes top of the list, above the Balearic Islands (18.1%) and the Canary Islands (17.6%). The average stay of international tourists is 9 nights, with an average expenditure of 966 euro per person.

On the other hand, national residents represent the highest percentage of tourism demand in Spain, with a total of 158.7 million trips in 2012. However, domestic tourism has experienced a noticeable reduction (−5.2%) over the 2005–2012 period, likely because of the economic situation in the country. Andalusia, Catalonia and Valencia are the preferred destinations for domestic tourism. This sector has a different behavior when compared to international tourism, as level of expenditure and demand of quality tourist services are generally lower. Regarding the type of trips, domestic tourism is concentrated on weekend trips (53.9%) and visits to relatives and friends (25.8%). Unlike international tourism, summer holidays (13.1%) and Easter (3.2%) represent a lower percentage. As a result, concerning type of accommodation, dwelling of family or friends (39.7%) and owned dwelling (29.3%) are the most common options. Hotels and resort accommodation only represents 17.7%, with a decreasing trend over the last few years.

Despite traditionally based in the so-called*sun and beach* offer, the tourism market in Spain started to diversify to new touristic products years ago, by promoting natural landmarks and urban destinations. The latter undergone a significant increase in both public and private investments aimed at improving Spanish competitiveness in this field, in terms of maintenance of cultural heritage buildings, construction of new hotels, etc. As a result, urban tourism in the country grew by 40% during the 2002–2011 period (Exceltur, 2013). However, the excess in tourist infrastructure previously built became evident at the beginning of the economic crisis, when a noticeable decrease in tourist demand and earnings (−4.6%) occurred. According to the Instituto Nacional de Estadística (2013), urban tourism comprised 25% of total overnight stays in 2012 and currently represents around 16% of local GDP.

Concerning the transport mode chosen for tourism purpose, in 2012 80% of international tourists reached Spain by plane and 17.7% by road (Ministerio de Industria, Energía y Turismo, 2013). Boat (2.1%) and rail (0.2%) were very rare means of transport to the country from abroad. As for domestic tourism, the road (89.1%) is the most common option used for internal trips, with a smaller share for plane (5.6%) and rail (5.3%).

3.2. The Spanish High Speed Rail (Alta Velocidad Española)

In November 2013, Spain has the world´s second longest high-speed network, after China, and the longest in Europe (Ministerio de Asuntos Exteriores y Cooperación, MAEC, 2013), with around 2,900 km of HSR lines in operation (see Fig. 1). The service of HSR in Spain – known as AVE, *Alta Velocidad Española*– is operated by RENFE Operadora, the Spanish national railway company. Since 2005, AVE trains run on a HSR network owned and managed by ADIF, the public company in charge of the management of most of the Spanish railway infrastructure. Although RENFE Operadora is the only company operating the high-speed trains nowadays (Comisión Nacional de la Competencia, 2013), private companies may be allowed to operate trains in the future, in accordance with the EU legislation.

During the last 20 years, the Spanish high-speed network has been rapidly developed no matter whether there was sufficient demand to justify the construction of new lines. As a consequence of this policy the system is characterized by a reduced economic feasibility (International Transport Forum, ITF, 2013). The first high-speed line was opened in 1992, connecting the cities of Madrid, Cordova and Seville. It was designed according to the technical standards of the French high-speed TGV.

In the following years, the network was extended towards the northern part of the country, with the aim to create a connection to France and thus to the European high-speed network. Despite several problems encountered during the construction process, the Madrid–French Border line reached the cities of Zaragoza (2003) and Barcelona (2008). This line connects the two most populated urban areas in Spain – separated by 620 km – in 2 h 30 min, which has led to a great success. It was recently expanded to the city of Figueras, near the French border, and Perpignan. However, due to a lack of harmonization of certain technical aspects, until very recently (late 2013) a direct international connection between France and Spain was not fully met and passengers were required to change trains or wait for a track gauge changeover at Figueras station. Furthermore, in the last few years the high-speed network has been extended to connect some of the most populated cities in the Spanish Mediterranean coast such as Málaga (2007), Valencia (2010) and Alicante (2013), with great tourist appealing, too. However, due to the shortfall of budgetary resources caused by the economic recession in Spain, the government has postponed or canceled some of the high-speed projects already approved (Pagliara et al., 2012).

Both RENFE and different governments in Spain have acknowledged the great potential of HSR services to contribute to tourism demand by launching touristic promotions linked to HSR. In this respect, the local governments from the 18 most noted

AVE line	Annual passengers (millions)
Madrid – Seville	5.55
Madrid – Valladolid	3.19
Madrid-Barcelona-Figueras	5.14
Córdoba – Málaga	2.35
Madrid – Cuenca –Valencia	5.84
Orense – La Coruña	0.27
Other High-Speed services	6.04
TOTAL	28.38

Fig. 1. Spain's HSR network as of November 2013, and annual passengers in the main AVE lines for 2012. Source: Turismoytren.com (2013).

HSR-connected destinations created the *Avexperience* consortium, with the aim to promote HSR as a way to visit other Spanish cities from the origin point. Through the *Spain Pass*, a flexible train pass only valid for non-residents in Spain, users can buy multiple-journey tickets and enjoy significant discounts at museums, restaurants, tourist passes, etc.

4. Methodology and its implementation to the case study of Madrid

4.1. Model specification

In this paper we calibrate two models. The first one intends to identify the key factors influencing holidaymakers to revisit Madrid given the fact that this city is accessible by HSR. The second model intends to find evidence on the extent to which HSR services influence tourists' destination choices, particularly in order to calculate the probability of choosing HSR for visiting other cities close to Madrid.

The model approach that we use in this paper is the logistic regression. The literature on logistic regression is large and has been rapidly growing since 1970. This methodology has been consolidated over time and has become an integral component of any discrete data analysis (Kleymann and Seristö, 2004). Models using logistic regression have been applied to tourism demand analysis (Witt and Witt, 1995), mainly with the objective of studying the decision to go or not to go on holiday.

For the two models developed, respondents participating in the Revealed Preference survey were presented a binary discrete-choice situation. That is, they were asked about the probability of revisiting Madrid as a tourist destination, and the possibility of visiting other cities close to Madrid. Those models with a binary dependent variable can be easily estimated by using a binomial logit specification. Given a certain number of explanatory variables X_i, the logit model calculates the probability of choosing i, P_i, if a logistic distribution function is assumed:

$$P_i = \frac{e^{V_i}}{1 + e^{V_i}} \tag{1}$$

where $P_i = E(Y = 1 | X_i)$. The V_i parameter in (1) comprises the set of explanatory variables X_i considered in the analysis:

$$V_i = \alpha + \beta_i X_i + \varepsilon_i \tag{2}$$

where α is the intercept, β_i are the elements of the vector of slope parameters, and ε_i represents the stochastic error term. Then, the logistic regression predicts the logit of the odds ratio, L_i, given multiple explanatory variables X_i (Peng and SO, 2002):

$$L_i = ln\frac{P_i}{1 - P_i} = \alpha + \beta_1 x_1 + \beta_2 x_2 \ldots + \beta_k x_k \tag{3}$$

The predictors to calibrate the models designed in this paper were obtained from a Revealed Preference survey that will be described in the following subsection.

4.2. The Revealed Preference survey in Madrid

A Revealed Preference (RP) survey was conducted from June 24th till June 28th, 2013 (10:00 a.m.–2:00 p.m./04:00 p.m.–7:00 p.m.) in Madrid. The locations chosen comprised four famous tourist places, i.e. Royal palace, Mayor square, and Prado and Reina Sofía museums. We collected 501 complete interviews, with a balanced representation of men (54.7%) and women (45.3%).

The main socioeconomic characteristics of the sample are shown in Table 1, which shows that 27.7% of the tourists were, while 72.3% were foreigners. Tourists between 25 and 44 years old were the most represented ones. Table 1 shows that 46% of the tourists in the sample were singles while 54% were partnered. The majority of respondents traveled in group, mostly with partner (30.5% of the sample) or relatives (27%). Most of the respondents (71%) had a university degree. The sample mainly comprised employees (45.5%), with lower percentages of students (18%). For 32% of the sample, the income was higher than €2500 a month, while the income was lower than €500 for 29% of the respondents.

Table 2 shows the transport mode used by the tourists of the sample to arrive in Madrid. It is notable that Spanish and foreign tourists have a very different behavior. For obvious reasons, the airplane is used mainly by foreign tourists (78.5%), due to the impossibility to opt for other modes, especially for those tourists living in Asia or America. European tourists have also import constraints to choose HSR to get to Spain given the poor

Table 1
Socioeconomic characteristics of the tourist sample in Madrid.

THE TOURIST TYPE	**%**
SPANISH TOURISTS	27.7
FOREIGN TOURISTS	72.3
GENDER	**%**
MAN	54.7%
WOMAN	45.3%
MARITAL STATUS	**%**
SINGLE	45.3
PARTENERED	11.6
MARRIED	41.3
WIDOWED	1.8
AGE	**%**
18–25	25.7
26–45	38.1
46–65	29.3
> 65	6.8
LEVEL OF EDUCATION	**%**
SECONDARY-SCHOOL	2.0
HIGH-SCHOOL	26.9
UNIVERSITY	71.1
MONTHLY INCOME	**%**
< 500	28.7
500–1500	20.8
1500–2500	18.6
2500–3500	13.4
3500–4500	8.4
> 4500	10.2
PROFESSIONAL STATUS	**%**
EMPLOYEE	45.5
UNEMPLOYEE	5.0
HOUSEWIFE/MAN	2.0
FREELANCE	9.0
MANAGER/EXECUTIVE	5.8
STUDENT	18.2
STUDENT EMPLOYEE	3.2
RETIRED	10.8
OTHER	0.6

Table 2
Transport mode.

TRANSPORTMODE	**ALL TOURISTS SURVEYED IN MADRID (%)**	**SPANISH TOURISTS (%)**	**FOREIGN TOURISTS (%)**
HSR	12.8	28.1	6.9
CAR	11.0	28.1	4.4
PLANE	59.1	8.6	78.5
PARTIAL HSR	4.0	11.5	1.1
COACH	9.2	18.0	5.8
INTERCITY	4.0	5.8	3.3
TRANSPORT MODE	**MADRID (%)**	**ROME (%)**	**PARIS (%)**
HSR	12.8	27.0	49.0
CAR	11.0	3.0	15.0
PLANE	59.1	35.0	33.5
TRAIN	8.0	34.0	2.0
COACH	9.2	1.0	0.5

international rail connections with Spain. By contrast, the airplane was chosen only by a small percentage of domestic tourists (8.6%), while the most common choices correspond to the car (28%) and HSR (28%).

The total duration of the tourist trip in the sample was on average 14 days, including departure from home, arrival in Madrid, travel to other cities, overnight and return home. Moreover, 5 days was the average duration of the stay in Madrid, including overnight stays in the city. These results may be influenced by the fact that the interviews have been conducted in a period of time within short national holidays. The same number of nights has been registered for Paris (Delaplace et al., 2014) and Rome (Valeri et al., 2012). The average budget estimated in the sample is 2150€.

Table 3
Criteria influencing the choice of Madrid as destination for tourism purposes (%).

MOTIVATIONS	**1st CHOICE (%)**	**2nd CHOICE (%)**	**3nd CHOICE (%)**
RELATIVES/FRIENDS	26.3	7.2	9.0
HISTORICAL AND ARCHITECTURAL LANDMARKS/MUSEUMS	40.1	32.3	15.7
NATIONAL CULTURE/GASTRONOMY	15.8	41.0	27.7
LESS COSTLY THEN OTHER DESTINATIONS	1.4	4.2	10.9
GOOD QUALITY OF TOURISM PROMOTION	3.2	5.7	16.1
SHOPPING AND GENERAL EVENTS (SPORT, MUSIC, ETC.)	12.4	7.7	15.7
HSR	0.8	2.0	4.9

Table 3 shows the criteria, sorted by preference choice, whereby the respondents chose Madrid as destination for tourism purposes. The historical and architectural landmarks are the main motivations (40.1%) followed by the presence of relatives/friends in the area of Madrid (26.3%). The Spanish tourists do not seem to consider the availability of HSR services when choosing a tourist destination. However, it is important to note that 65.5% of the respondents influenced by HSR services actually used HSR to get to Madrid.

For 64% of the sample, the reason why they did not use HSR to get to Madrid was the fact that it was not an option available because the only way to get to Madrid was by air transportation. Other important reason for not choosing HSR was the high price of the HSR ticket (17.5%), especially in the case of domestic tourists.

We note that 78% of the respondents were willing to revisit Madrid for another holiday, a bit less than other cities such as Paris (98%) and Rome (84%) according to Delaplace et al. (2014). Those who intended to return to Madrid were driven by the richness of the historical, artistic, monumental heritage and cultural events (48%). By contrast, tourists having already visited all the attractions in Madrid (43%), and tourists living far away from Spain (37.3%) were more reluctant to return.

Table 4
HSR impact on the choice of revisiting a tourist destination (%).

High Speed Rail as a crucial factor influencing the choice of revisiting Madrid			
YES	41.1%		
NO	58.9%		
MOTIVATIONS	**1st CHOICE (%)**	**2nd CHOICE (%)**	**3nd CHOICE (%)**
LESS TRAVEL TIME	65.8	12.5	7.4
ACCESSIBILITY OF THE DEPARTURE/ARRIVAL STATION	7.0	13.8	11.6
FREQUENCY OF SERVICE	0.5	9.4	8.3
LESS COSTLY	3.5	10.6	5.0
VISITING OTHER CITIES LINKED BY HSR	12.1	11.3	15.7
SAFETY	0.5	12.5	13.2
ENVIRONMENTALLY FRIENDLY	1.5	6.9	5.0
COMFORT	8.5	23.1	32.2
OTHER	0.5	0.0	1.7

5. Results

5.1. The probability of revisiting Madrid

The survey provides information about the impacts of HSR on revisiting Madrid. In case of having HSR services linking their city with a tourist destination, 41% of respondents would be positively influenced by the presence of HSR to revisit Madrid. The main reason for 65.8% of those positively influenced by HSR is that travel time is shorter (see Table 4). The opportunity to visit other cities linked by HSR (13%) and the accessibility of the departure/arrival station (7%) were also important drivers.

On the basis of the information obtained from the survey, we calibrated a first model (MODEL 1) aimed at identifying the type of tourists that most likely would revisit Madrid, given their socio-economic, tourist and transport-related characteristics. Given the results from the survey, the model chosen is the following:

$$\begin{aligned}\text{Predicted logit(REVISIT} = 1) = {} & \beta_0 + \beta_1\text{NATION} + \beta_2\text{MARRIED} \\ & + \beta_3\text{FREELANCE} + \beta_4\text{ARCH\_MUSEUM} + \beta_5\text{TRANSP\_COST} \\ & > 700€ + \beta_6\text{FIRST\_TIME\_MAD} + \beta_7\text{STAYRELAT\_HOME} \\ & + \beta_8\text{AVE} \end{aligned} \quad (4)$$

where the explanatory variables considered are:

NATION	equals to 1 if the tourist is; 0 otherwise.
MARRIED	equals to 1 if the tourist is married; 0 otherwise.
FREELANCE	equals to 1 if the tourist is a freelance; 0 otherwise.
ARCH_MUSEUM	equals to 1 if the tourist is willing to come back to Madrid for its historical-architectural heritage; 0 otherwise.
TRANSP_COST > 700€	equals to 1 if the tourist has spent more than 700€ in; 0 otherwise.
FIRST_TIME_MADRID	equals to 1 if the tourist has never been before in Madrid; 0 otherwise.
STAY_RELAT_HOME	equals to 1 if the tourist stays at his/her relatives' home; 0 otherwise.
HSR	equals to 1 if the tourist is influenced by HSR services in the choice of revisiting Madrid; 0 otherwise.

As can be seen in Eq. (4), the dependent variable is the willingness to revisit Madrid (Yes: 1, No: 0), and the explanatory variables are the attributes listed above. Estimates for this model are reported in Table 5.

Table 6
Cities chosen by tourists other than Madrid.

CITY	%	DISTANCE (km)	TRAVEL TIME BY CAR (h)	POPULATION (inh)	AVE CONNECTION
Toledo	26	72	0,8	84,019	X
Barcellona	16	621	5,7	1,621,000	X
Segovia	10	91	1	55,220	X
Granada	9	418	4	239,217	
Malaga	7	529	5	567,433	X
Cordoba	5	397	3,8	328,488	X
Sevilla	4	534	4,8	705,188	X
Valencia	3	357	3,3	810,064	X
Alicante	3	421	3,8	334,329	X
Aranjuez	3	48	0,6	40,797	
Santiago	2	602	5,5	95,092	
La Coruna	2	591	5,5	245,923	
Leon	2	337	3,2	132,744	
Other cities	7				

The model presents a high explanatory power ($R^2 = 0.493$; $R^2_{adjusted} = 0.485$), which indicates that the regression fits the sample data pretty well. All the variables are highly significant and with the expected sign, if we except TRANSP_COST > 700€, that has a correct sign but it is not statistically significant; as well as the HSR variable, that is not statistically significant and has a negative impact on the probability to revisit Madrid. This result is consistent with the unfeasibility of reaching Madrid by HSR for a great share of the tourists. Additionally, the satisfaction of past experience (FIRST_TIME_MADRID) has a positive impact on the probability to revisit Madrid, so those respondents who already visited Madrid have a higher chance of returning. With regard to the socio-economic characteristics, seem to have a higher probability to revisit Madrid than foreigners, likely due to thedistance from their home town.

Transport characteristics do not seem to have a big impact on the destination choice in model 1. The reason seems to be the unfeasibility for a great share of foreign tourists to choose a means of transport different from the airplane. The transportation cost in the tourist trip has the expected sign in the model, but it is not statistically significant, which means that it is not an attribute greatly influencing the destination choice. Nevertheless, the quality of promotion of historic and artistic heritage resources plays a major role. Therefore, the main outcome of the Madrid case study is that tourists are willing to revisit the city regardless of the presence of HSR, due to the high percentage of tourists in the sample travelling from countries far away from Spain.

Table 5
Motivations influencing the choice of HSR for visiting cities close to Madrid by HSR.

MOTIVATIONS FOR USING HSR	1st CHOICE (%)	2nd CHOICE (%)	3rd CHOICE (%)	MOTIVATION FOR NOT USING HSR	1st CHOICE (%)	2nd CHOICE (%)	3rd CHOICE (%)
LESS TRAVEL TIME	73.6	8.8	7.7	LESS TRAVEL TIME	5.1	17.6	20.0
ACCESSIBILITY OF DEPARTURE/ ARRIVAL STATION	2.9	18.4	11.5	ACCESSIBILITY OF DEPARTURE/ARRIVAL STATION	8.8	17.6	40.0
FREQUENCY OF SERVICE	0.6	6.6	8.7	TRAVEL COST	33.8	29.4	40.0
LESS COSTLY	6.3	14.7	9.6	TOO MANY TRANSFER	0.7	17.6	0.0
VISITING OTHER CITIES LINKED BY HSR	4.0	11.0	12.5	OTHER	51.5	17.6	0.0
SECURITY	0.0	11.0	17.3				
ENVIRONMENTALLY FRIENDLY	1.7	4.4	2.9				
COMFORT	10.3	25.0	29.8				
OTHER	0.6	4.4	1.0				

Table 7
Estimation results: MODEL 1.

VARIABLE	COEFFICIENT (*T*-VALUE)
NATION	0.121 (3.633)
MARRIED	−0.063 (−2.315)
FREELANCE	0.104 (2.2040)
TRANSP_COST > 700€	−0.028 (−0.954)
FIRST_TIME_MADRID	−0.083 (−2.809)
STAY_RELAT_HOME	0.111 (2.131)
ARCH_MUSEUM	0.559 (20.409)
AVE	−0.015 (−0.552)

5.2. The probability of revisiting nearby cities by HSR

The survey shows that 62.1% of the respondents visited other places during their holiday trips, and 56% of them chose HSR as a means of transport. Moreover, 90% of the respondents visiting other destinations were foreign tourists, and 52% of them used HSR in this specific trip. The main reason to do that (see Table 6) was the shorter travel time offered by HSR (73.6%). On the other hand, the main motivations for not using HSR to visit other cities near Madrid were the high price of the ticket (34%) and the absence of a HSR link between Madrid and the chosen destination (51%).

The cities chosen by the tourists of the sample are reported in Table 7. It is important to underline that tourists had more than one option to choose. Barcelona was clearly the most visited city (180 respondents), due to its successful tourism promotion and its high-quality rail connections. Among the most cited destinations we found Toledo (95) and Segovia (41), which are closer to Madrid and connected with HSR. Also with remarkable architectural landmarks, the cities of Seville (60 respondents) and Valencia (38) also showed great attractiveness for tourists, favoured by competitive HSR connections. It is important to note that, with the exception of Granada, all of the 8 most visited cities in the sample are linked by HRS.

Based on the results of the survey about the motivation for revisiting other cities nearby Madrid, we designed a second model (MODEL 2) aimed at identifying the variables which have an impact on the use of HSR to travel, for tourism purposes, from Madrid to nearby cities linked by HSR, such as Barcelona, Seville, Valencia, Cordova, etc. The model specification for this case is shown in (5):

$$\begin{aligned}\text{Predicted logit (AVE\_NEAR\_CITIES} = 1) &= \beta 0 + \beta 1\ \text{NATION} + \beta 2\ \text{TICKET\_PRICE} + \beta 3\\ &\text{STATION\_ACCESS} + \beta 4\ \text{SERV\_FREQ} + \beta 5\\ &\text{EASY\_NEAR\_CITIES} + \beta 6\ \text{SAFETY} + \beta 7\ \text{COMFORT}\end{aligned} \quad (5)$$

where the variables are:

NATION	equals to 1 if the tourist is Spanish; 0 otherwise.
TICKET_PRICE	equals to 1 if ticket cost has influenced the tourist in the choice of HSR; 0 otherwise
STATION_ACCESS	equals to 1 if the station accessibility has influenced the tourist in the choice of HSR
SERV_FREQ	equals to 1 if service frequency has influenced the tourist in the choice of HSR; 0 otherwise
EASY_2NEARCITIES	equals to 1 if the easy access to two at least near cities to Madrid has influenced the tourist in the choice of HSR; 0 otherwise.
SAFETY	equals to 1 if safety has influenced the tourist in the choice of HSR; 0 otherwise.
COMFORT	equals to 1 if comfort has influenced the tourist in the choice of HSR; 0 otherwise

Table 8
Estimation results: MODEL 2.

VARIABLE	COEFFICIENT (*T*-VALUE)
NATION	−0.140 (−2.249)
TICKET_PRICE	−0.359 (−6.921)
STATION_ACCESS	0.398 (7.419)
SERV_FREQ	0.328 (4.317)
EASY_2NEARCITIES	0.296 (5.101)
SAFETY	0.273 (4.547)
COMFORT	0.456 (10.658)

The dependent variable is the influence of the presence of HSR on promoting a tourist visit to a Spanish HSR-linked city (Important: 1, Not important: 0). The explanatory variables included in the model are socio-demographic and transport characteristics. The estimates for MODEL 2 are reported in Table 8.

Again, the model proposed shows a high explanatory power ($R^2 = 0.631$; $R^2_{\text{adjusted}} = 0.594$). All variables have the expected sign and are statistically significant. The probability to reach two near cities by AVE (EASY_2NEARCITIES), the accessibility of the departure/arrival station (STATION_ACCESS), travel comfort (COMFORT), service frequency (SERV_FREQ) and safety (SAFETY) have a positive impact on the probability to use HSR services to visit other cities located near Madrid. The price of the ticket (TICKET_PRICE) has a negative impact, even though many tourists use HSR because in certain cases it might be cheaper than other transport modes.

Tourists using HSR to move to a city close to Madrid by HSR are mainly foreigners. This trend is confirmed by the negative sign of the variable NATION. As can be seen from the results, the possibility of visiting near cities close to the origin point is a key driver to choose HSR for a certain segment of the tourist demand and a clear factor to improve tourist attractiveness.

6. Conclusions and further perspectives

This paper has developed two logistic regression models to find evidence on the impact of HSR services on the tourism market. They focus on identifying the key factors influencing tourists to revisit a holiday destination, as well as the probability of choosing HSR for visiting nearby cities. The research has provided some interesting conclusions.

The first conclusion is that improving the knowledge of tourist demand is a crucial factor to develop a suitable strategy to attract tourists to a certain region. This paper has identified the main features characterising the tourism market in Madrid. The questionnaire conducted has shown that, in general terms, domestic and foreign tourists have different characteristics and behaviors. Therefore, the implementation of tourist products specifically adapted to each segment of demand seems essential to strengthen the tourist attraction in a competitive environment.

The second conclusion is that, for the case of Madrid, the presence of HSR does not seem to be a key factor influencing the destination choice of tourists. There seems to be some reasons behind that. First, a great percentage of tourists come from countries far away from Spain (as it happens with Asians and Americans), so the airplane is for them the only available means of transportation to reach Madrid. Second, the low quality of the international rail connections between Spain and its neighbouring nations keeps Europeans from using HSR to arrive the country. In this respect,

further measures need to be adopted by the countries to make HSR network in Spain more accessible for European tourists.

The third conclusion is that HSR shows great attractiveness for foreign tourists, as they generally value aspects such as comfort and travel time reductions, and are generally less sensitive to ticket prices. The research has made it clear that other significant motivation for choosing HSR is the possibility to visit nearby cities accessible by high-quality means of transport. The public sector in Spain seems to be aware of that, and some steps to promote the use of HSR by foreign tourists have been taken in the right direction, such as the creation of the *Avexperience* consortium and the implementation of the *Spain Pass*. However, further efforts are needed in this field to offer a more integrated product for this segment of the tourist demand. In this respect, it would be interesting to look at the case of France where a given number of intermediate cities served by TGV around Paris are now seeking to develop their heritage resources to develop tourism-related activities, being the TGV considered as a possible vector for their valorization (Bazin et al., 2013).

These findings provide useful information for analysts in their efforts to target specific segments in the case of the Spanish tourism market. A greater awareness of tourists´ characteristics with respect to a specific destination like Madrid represents an important input for improving packaging and promotion. HSR operators, for instance, could improve the current policy regarding foreign tourists and develop HSR discount policies in order to foster travelling for leisure purposes. The results obtained suggest the implementation of more sophisticated and wide ranging surveys taking into consideration other relevant and transport–related dimensions at a regional, national and international level as well.

From the results of this paper, some aspects can be pointed out for further research. First, the analysis of the Madrid case study could be extended to address additional features, such as the relationship between HSR and social equity. In this respect, studying the new policy on the Spanish HSR, consisting in varying the price of the tickets according to the demand-with high discounts at certain times– would be of great interest. Additionally, a transnational analysis could be developed to compare the results concluded in this paper with existing research conducted in other European cities, such as Rome and Paris (Delaplace et al., 2014). Finally, it would be interesting to study the HSR station in Madrid according to the new theory which conceives HSR stations as places of service innovations (Delaplace, 2012).

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